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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/734,768

12/12/2003

Jiong-Ping Lu

TI-36196

1785

23494

7590

10/13/2004

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EXAMINER

LEBENTRITT, MICHAEL

ART UNIT

PAPER NUMBER

2824

DATE MAILED: 10/13/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/734,768

Applicant(s)

LU, JIONG-PING

Examiner

Michael S. Lebentritt

Art Unit

2824

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-11 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 9-11 is/are allowed.
- 6) ☒ Claim(s) 1-5, 7 and 8 is/are rejected.
- 7) ☒ Claim(s) 6 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 12 April 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date ____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: ____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-5 and 7,8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Besser et al, US Patent 6,773,978 and further in view of Mikagi, US Patent 6,232,227

Besser discloses forming a polysilicon gate structure (204) over a semiconductor body; forming a layer of nickel (220) over said semiconductor body including over said polysilicon gate structure, forming a capping layer (221) over said layer of nickel, said capping layer comprising a material with an affinity for boron; then, annealing the semiconductor body to completely convert said polysilicon gate structure into Nisi gate electrode, and removing said capping layer and unreacted portions of said layer of nickel. Please see figures 3-4f. Besser further teaches: wherein said capping layer comprises a transition metal-nitride; wherein said capping layer comprises TiN. Wherein said annealing step occurs at a temperature in the range of 400 C to 600 C. Further comprising the step of forming a gate dielectric (212) on said semiconductor body prior to forming the polysilicon gate structure such that said gate dielectric is located between said semiconductor body and polysilicon gate structure. Besser further

discloses wherein said removing steps comprises a wet etch. Please see discussion on column 5, line 5 to column 7, line 35.

Besser is applied supra but lacks the anticipation of forming CMOS polysilicon gate electrodes and wherein said wet etch chemistry comprise a sulfuric acid and peroxide mixture. Examiner takes official notice that it is well known in the art to wet etch using a wet etch chemistry that comprises a sulfuric acid and peroxide mixture. Mikagi discloses forming CMOS polysilicon gate electrodes. (Please see figure 1A) In view of this disclosure it would have been obvious to one of ordinary skill in the art at the time of invention to form CMOS polysilicon gate electrodes as taught by Mikagi, in view of the primary reference of Besser, because Mikagi teaches a similar invention in which a top portion of the gate electrode is converted into NiSi.

Allowable Subject Matter

Claims 9-11 are allowed.

The following is an examiner's statement of reasons for allowance: the prior art references fail to teach: annealing the semiconductor body to completely convert said polysilicon gate structures to NiSi gate electrodes by reacting portions of said nickel layer with said polysilicon gate structures, wherein boron is redistributed during the annealing step with portion of the boron diffusing into said capping layer as specified in claim 9.

Claim 6 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: Mikagi and Besser teach that TiN is used to getter oxygen during the annealing. Prior art references fail to teach wherein said capping layer attracts a significant amount of boron away from an interface with said gate dielectric in a PMOS transistor but does not attract a significant amount of arsenic away from an interface with said gate dielectric in an NMOS transistor during said annealing step.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael S. Lebentritt whose telephone number is 571-272-1873. The examiner can normally be reached on 5/4/9.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richard Elms can be reached on 571-272-1869. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Michael S. Lebentritt
Primary Examiner
Art Unit 2824
